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Study of Mineral and Organic pollution of the unsaturated zone (UZ) of the bowl Ouargla, Southeast Algerian.

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Abstract

In the bowl of Ouargla, pollution of groundwater is the main topic that worries people and authorities. This work is to study the causes of groundwater pollution (UZ). We conducted sampling and analysis on site and in the laboratory, the number of wells in the basin in order to achieve has a database to solve the problems which characterize the latter. Based on analyzes of groundwater vulnerability we treated water bowl pollution, map the evolution of the pollution index is of utmost importance for the protection against pollution.

Selection and peer-review under responsibility of the Euro-Mediterranean Institute for Sustainable Development (EUMISD)

Keywords: Polluants, uz, water, contamination index, Ouargla;

1. Introduction

Its role vital interface between the biosphere, man and the environment, and character practically non-renewable at the level of human generations, water is a heritage that sustainable management should be imposed as a key concern. Human activities are the source of groundwater contamination. The estimation of pollutant emissions and their distribution in the water was the subject of various recent studies.

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Our study area is an area for agricultural purposes. What makes it a major user of water, sounds much about the demand for drinking water continues to increase in recent years due to demographic rates? In the case of the bowl Ouargla, the pollution caused by the discharge of water has reached an alarming level due to the diversity of pollutants and the large amount of waste water (40,906 m3 / d in 2005) . Groundwater wells are operated by agricultural and domestic purposes , crossed by a collector open channel [1], or by pollution generated from the geological formation of rocks (natural pollution).

2. Materials and methods

The area of Ouargla is situated north-east of the Great Algerian Sahara, it is distant 850 km from the capital Algiers. It is limited to the north by Djelfa and El-Oued departments, to the south by Illizi and Tamanrasset departments, to the west by Ghardaia department and east by Tunisia. The Basin of Ouargla corresponding to a great depression (a big Oasis of the Algerian Sahara), which covers an area of about 750 km^2 (Fig. 1) [3].

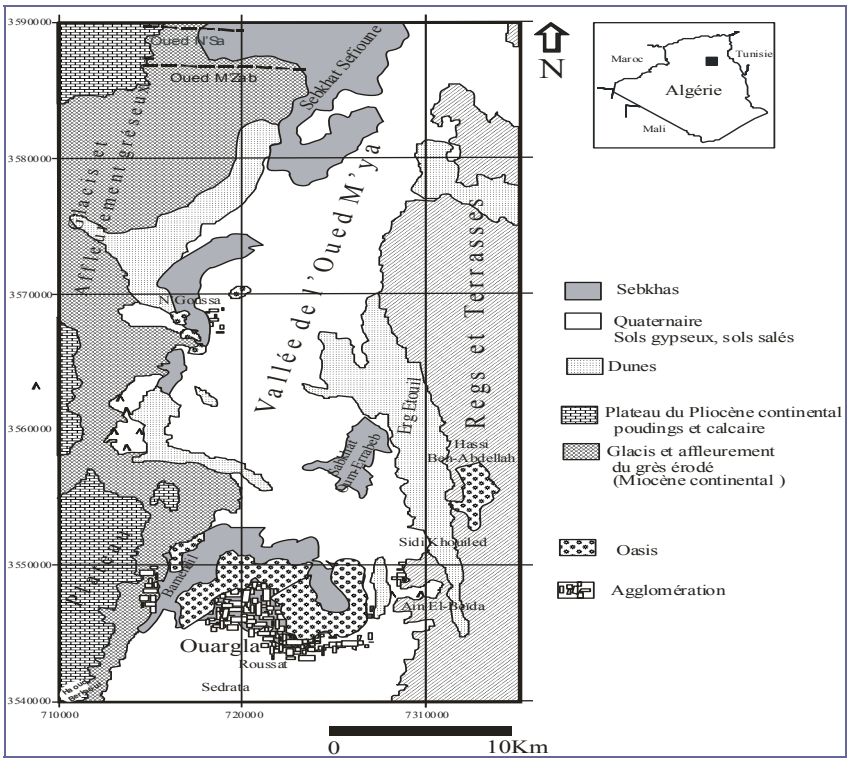


Fig. 1. Localization of the studied area.

Its natural limits are defined males: it is limited to the west by a calcareous plate, to the east by a plate whose boundaries are not clear; to the south by a massive dune covers the ruins of Sedrata and the North by Zabret Bouaroua. The appearance climate of the region is desert or hyper arid: precipitations are low and erratic, ranging from 0.01 and 17.2 mm by exceptional year [4]. Temperatures vary greatly between night and day. The average annual temperature ranges from 06°C (January) and 43°C (July).

The evapotranspiration, also varies between 380 (July) and 112 mm (January). The lithology of the aquifer consists of fine to medium sand clay, rarely coarse south of Ouargla and more to the North (N'goussa) sands are rich in gypsum, which becomes dominant Sebkhet Safioune [5]. At the basin of Ouargla the surface aquifer is not exploited because of the rate of salt contained in its waters. It is thick from 1 to 8 m and is based on a tight

impermeable level, which occupies the bottom of the valley of Ouargla and isolates it from the underlying aquifers. The aquifer is recharged by:

. Wastewater discharges of domestic origin
. Excess water tied to a palm irrigation irrational
. Runoff from the upper sections and the input of the three Wadis flooding in the bassin (N'sa, M'zab and M'ya).

2.1 Properties basement:

The properties of basement influence on the transfer of contaminants into groundwater are porosity, heterogeneity, fracturing and discontinuities creating preferential flow paths. [01] The soil and subsoil, for the first, distinguished by physical training, the unsaturated zone and the saturated zone for the second, by reference to the position of the roof of the uppermost aquifer. [06] The floor will be located in the unsaturated zone (UZ), and there are places in the basement belonging to the UZ If the roof surface (groundwater flush, swamp, etc), all or part of the soil belongs to the zone saturated.

Table 2. Codification of water points

Point d'aux	Nom
P1	Matmoura
P2	Gherbouz 1
P3	Gherbouz 2
P4	Lala mimouna
P5	Cite bahmid
P6	Ouinet moussa
P7	Sidi khouiled 1
P8	Silice
P9	N'goussa
P10	Ifri 1
P11	Ifri 2
P12	Ain el beida
P13	Cite nacer
P14	El bour
P15	Hassi acheta
P16	El koum
P17	Bamendil
P18	El khefji 3
P19	El khefji 4

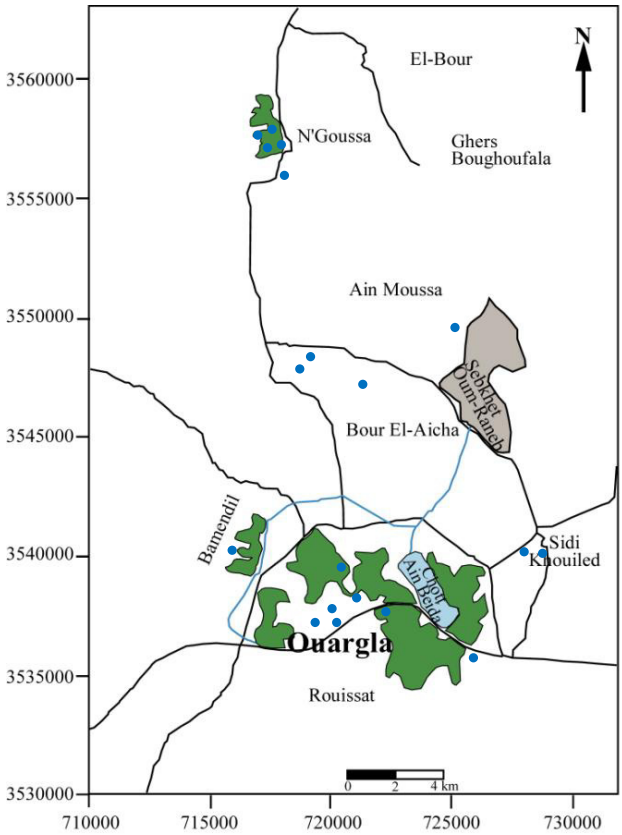
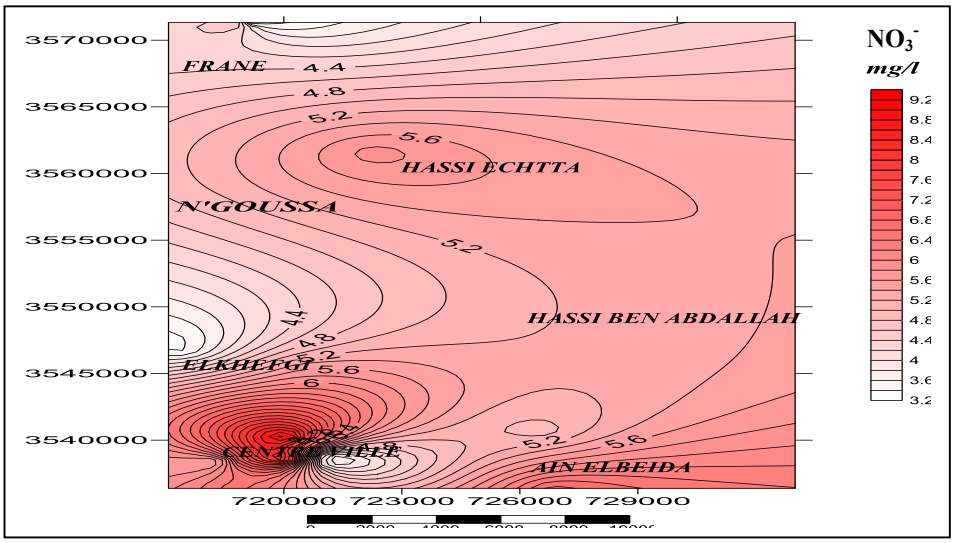
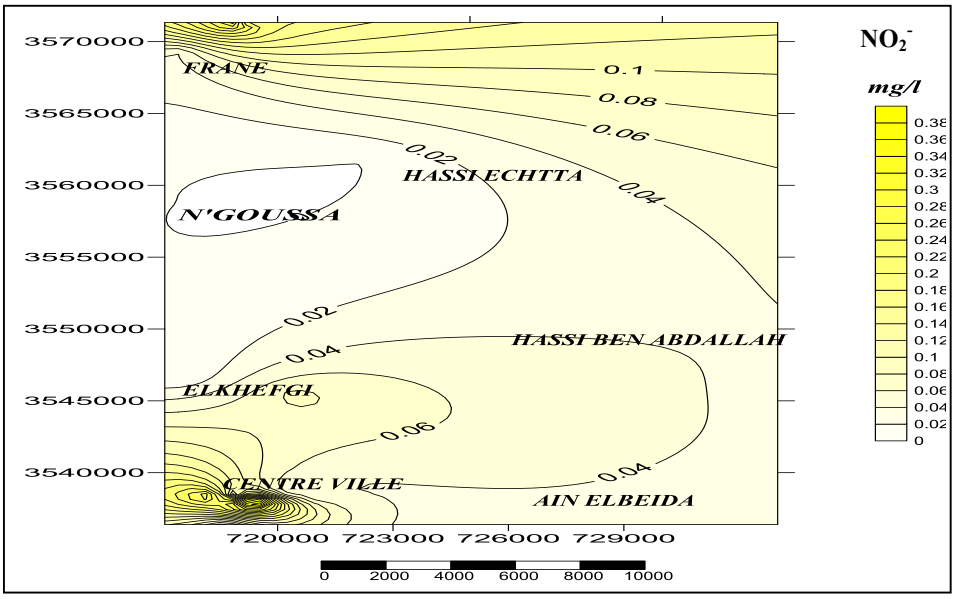


Fig. 2. Inventory map of the studied water points.

2.2. Parameters of organic pollution:





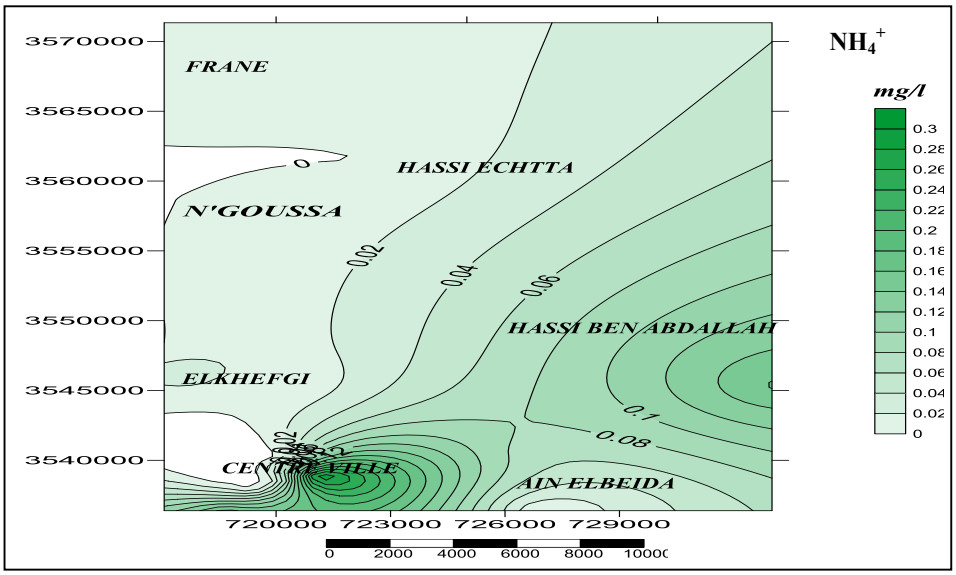


Fig3. changing parameters of organic pollutants.

Generally results in concentrations of organic pollution parameters in groundwater bowl Ouargla show acceptable values (always in the standards).

2.3. Mineral pollution parameters :

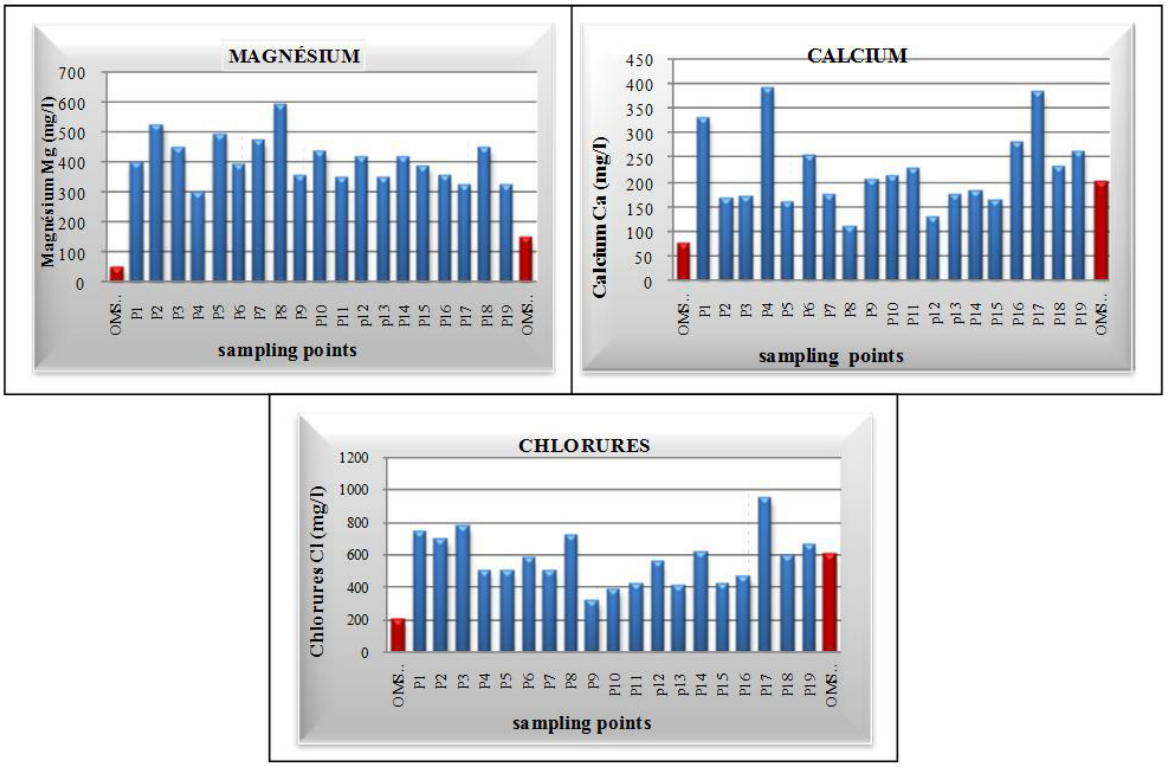


Fig4. Changing parameters of mineral pollutants.

- The chemical analyzes at the bowl , show that calcium concentrations range from 110 mg / l (Elkhefgi 2) and 393.3 mg / l (Bahmid) . Calcium is a parameter that contributes to the mineralization of waters. Its content varies substantially depending on the nature of the terrain traversed. Increases for limestone and gypsum especially land. This would originally dissolution of carbonate formations CaCO3, and gypsum alluvial formations (CaSO4) Quaternary located in depressions.
- Magnesium concentrations of groundwater varies between 296.7 mg / lpourla region Bahmid (P04) and 590 mg / l Elkhefgi 2 (P08). Its origins are comparable to that of calcium, as it comes:
  - Or the dissolution of carbonate formations at high levels (magnesite and dolomite).
  - Is rich in magnesium salt formations «MgSO4 ".

The graph shows that all water points bowl Ouargla exceed the WHO standard. The point in the busiest magnesium salts is Elkhefgi2 region (590 mg / l).

- The origin of chloride is mainly due to the dissolution of salt formations. The chloride concentrations in groundwater of the basin varies between 316.59 mg / l (SaidOtba) and 956.03 mg / l (Ain Beida).

Conclusion

This work was carried out over a period of observation in April 2013. A number of sample was conducted at experimental sites on the water points (boreholes), the study area is a bowl gypsum sand, and flat topography , climate as hyper .

Monitoring of physico- chemical and organic parameters detected a temporary change by varying the concentrations of all elements (chemical and organic). Hydrochemical this study is based on the physico- chemical analysis of 19 samples taken primarily drilling bowl of Ouargla.

• We have used a variety of analytical methods in the determination of minerals.
• The dominant ions are mostly the chlorides, calcium and magnesium.
• Ions: nitrate, nitrite and ammonium, the lower levels are in the bowl whatever the considered area. All results (levels) parameters of organic pollution were treated using specific software (Surfer 10).
• After the analyzes the most contaminated mineral pollution in bowl Ouargla region is the region of Ain Beida.
• We find that after working as pollution of groundwater in the basin of Ouargla generated by the geological formation of rocks (natural pollution).

In general, mineral water characteristics of the study area appeared generally poor with non- compliant potability values, especially as regards the most exploited layers (Low terminal complex).

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